Filth-Diseases and Their Prevention

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FILTH-DISEASES

AND

THEIR PREVENTION.

BY

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To Boards of Health and Citizens of Massachusetts: —

The undersigned members of the Massachusetts State Board of Health would respectfully, but earnestly, urge upon all persons the careful perusal of the following masterly essay by Mr. Simon, Chief Medical Officer of the Privy Council and of the Local Government Board of England. If the practical suggestions made therein were acted on by all citizens, hundreds of lives now annually doomed to destruction would be saved, and the health and comfort of the people greatly increased.

Henry I. Bowditch,
Richard Frothingham,
J. C. Hoadley,
R. T. Davis,
Daniel L. Webster,
J. B. Newhall,
W. L. Richardson, Sec'y pro tem.,

Members of the State Board of Health of Massachusetts.

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PREFATORY REMARKS TO THE AMERICAN EDITION.

It would be impossible, without injury to its general effect, to remove from the body of this essay the various references to the authority under which Mr. Simon acted, also those to certain papers and certain laws, some of which may seem at first sight irrelevant for us in America. It has therefore been deemed wise to print the paper almost exactly as it was originally offered, viz., as a Preface to a volume of admirable reports made by Government Inspectors upon several epidemics which had occurred in various parts of England (*vide* Reports of the Medical Officer of the Privy Council and Local Government Board, New Series, No. 2). To that volume, every reader who desires to see how far England is in advance of us in thorough sanitary work, is respectfully referred.

In our Appendix will be found a few of the summaries given by Mr. Simon, as illustrations of the origin of various epidemics. Each one of them is very suggestive, not only to England, but to every

householder in America. The Editors would urge upon every one the importance of a perusal of each one of these statements; and afterwards, if necessary, let him make due application of the instruction thereby gained, to the improvement of his own homestead.

A few notes only have been added, either explanatory of technical words, or in reference to the thoughts or suggestions in the text in their applicability to Massachusetts.

FILTH-DISEASES

AND

THEIR PREVENTION.

I.

1. In the subject-matter of Preventive Medicine, considered with reference to the administrative needs of England at the present time, Enteric (Typhoid) Fever, with the diseases which are allied to it in mode of origin, must necessarily, I think, stand as first topic: and I avail myself of this earliest opportunity to submit to the Local Government Board some observations on that class of diseases.

2. In my recent Annual Report, the vast amount of injury which is suffered day by day in this country through diseases well known to be preventable was referred to in regard of the responsibility which it imposes on all who have undertaken to serve in the new sanitary organization of the country; and I submitted that "the Local Government Board, viewed as a Central Board of Health, and the more than fifteen hundred District-Authorities which, each with its Medical Officer of

That very much disease is preventable, is the *raison d'être* of sanitary authorities.

Health, locally administer the Health Laws, may be regarded as having had their respective functions assigned to them in special and systematic relation to that state of things."

Among the consequences of preventable disease, only the deaths can be counted.

3. I do not pretend to give any exact statement of the total influence which preventable diseases exert against the efficiency and happiness of our population; for it is only so far as such diseases kill, and even thus far but very imperfectly, that the effect can be represented in numbers. Of the incalculable amount of physical suffering and disablement which they occasion, and of the sorrows and anxieties, the often permanent darkening of life, the straitened means of subsistence, the very frequent destitution and pauperism, which attend or follow such suffering, death-statistics, to which alone I can refer, testify only in sample or by suggestion.

Rough estimate of the mortality which is preventable:

4. That the deaths which we in each year register in this country (now about half a million a year) are fully one hundred and twenty-five thousand more numerous than they would be if existing knowledge of the chief causes of diseases, as affecting masses of population, were reasonably well applied throughout England, is, I believe, the common conviction of persons who have studied the subject. The statistical considerations which in the

first instance suggest that conclusion have so long and so admirably been put before the public in the successive Reports of the Registrar-General that I need but very briefly, and only by way of illustration, advert to them. Looking at England as a whole, we see that of each one hundred persons who die, not quite ten have reached the standard old age of seventy-five years; and that of each one hundred children born hardly seventy-four complete five years of life. We next see what appears to be a widely different expectation of life in different districts of the country; that while, for instance, in a considerable proportion (about a seventh of the number) of the districts into which England is divided for registration purposes, the death-rate of infants in the first year of life ranges from eight to twelve per cent, there is a still larger proportion of districts in which it ranges even from nineteen to thirty; and that, under the influence of these Herodian districts, the infant death-rate of England as a whole stands at the high average of eighteen. Similarly, taking the death-rate of the population at all ages living, we find that the present general English death-rate of about twenty-two and one-half per one thousand per annum, covers on the one hand local death-rates ranging from thirteen to seventeen, and on the other hand local death-rates which range even to far above thirty. *Primâ facie*, then, it would seem that influences hostile to life must be operating in parts of

England far more vehemently than in other parts; and we turn to the registered "causes of death" to learn from them, if we can, under what peculiarities of local assessment life is so differently taxed or mulcted in the different parts of this one country. Here of course we have to proceed with caution; for alleged causes of death may be registered on very imperfect non-medical testimony; and even medical certificates (since rapidly-growing knowledge cannot be equally distributed in a very large and wide-spread profession) may in variable proportions be so inexact or arbitrary in their naming of the causes of death as to be unavailable for comparisons in this respect. With due caution, however, cases of this sort can be set aside, or the fallacies which they would introduce be guarded against; and when, with such caution, different districts are compared in regard of the causes of death registered in them, this finer sort of comparison adds very greatly to the force of the rougher comparisons which were first made; for, so far as the register of "causes of death" can intelligibly answer us, it says that certain sorts of disease, — and those just the sorts which we in other ways know to be the most preventable, — are very greatly more fatal in some districts of England than in others. This statistical conclusion, as based on the local death-returns which are made to the Registrar-General, was to some extent indicated by Dr. William Farr more than thirty years ago in the earlier annual

reports of the General Register Office, and was afterwards more fully established and discussed in an important paper by Dr. Greenhow, which I had the honor of laying before the General Board of Health in 1858.[1] From the passing of the Public Health Act of that year, the unequal distribution of different diseases in England became matter for detailed medical investigation and advice under the Privy Council; and in proportion as particular districts have been medically inspected with regard to the prevalence in them of the particular diseases to which attention had been drawn, so has evidence become more and more complete with regard to the dependence of vast annual excesses of disease and death on causes which in the most moderate sense may be called removable.

preventable, namely, under action of law.

The causes of disease to which I here refer as removable are exclusively such as contravene Public Hygiene: such, namely, as affect more or less in common the mode of life of masses of population, and such as in most, if not in all instances, are already understood to be under ban of law. Doubtless much disease is also produced,

[1] "Papers relating to the Sanitary State of the People of England: being the Results of an Inquiry into the different Proportions of Death produced by certain Diseases in different Districts in England; communicated to the General Board of Health by Edward Headlam Greenhow, M.D., with an Introductory Report, by the Medical Officer of the Board, on the Preventability of certain Kinds of Premature Death."

and much life consequently wasted, through causes which are within the province of Private Hygiene; causes, which either are not of massive operation, or may at least easily be escaped at individual option, and which the law does not, and generally could not, take within its scope; but to such causes I do not advert as removable in the sense of my present argument.[1]

[1] We insert the following letter from Dr. Draper, successor to Dr. Derby, as examiner of the returns of births, deaths, and marriages of the State. — Am. Ed.

Boston, Sept. 25, 1875.

My dear Sir, — Your note of the 23d, requesting the "number of deaths from preventable diseases which have occurred in Massachusetts within the past few years, and the number of persons in this State cut down annually by such diseases before they are five years old," is before me. I find some difficulty in determining the exact limitations of the term "preventable," but I presume that sanitarians would generally agree that it might be applied to the class of zymotic diseases at least. The deaths from affections of this class in Massachusetts during the five years, 1869 to 1873, inclusive (the statistics of later years have not been received), amount to nearly forty-one thousand, an annual average of more than eight thousand. If we add to this the mortality from acute pulmonary diseases (bronchitis, pleurisy, pneumonia), the total for the five years will be over fifty-two thousand. If, again, we add the deaths from phthisis, as Mr. Simon intimates that we may, in our account of the controllable filth-diseases, the number becomes quite enormous, — seventy-eight thousand!

The deaths of children under five years old, during the period above mentioned, were as follows: From zymotic diseases, twenty-six thousand; from acute pulmonary diseases, four thousand five hundred; from phthisis, one thousand seven hundred, — an aggregate of over thirty-two thousand.

In order to represent these results in detail and with greater accuracy, I append the following table: —

5. Among causes which injuriously affect the Public Health of England, considered as a total, certain operate only in particular districts: as, for instance, some large adjacency of malarious or water-logged land, or some prevalent injurious industry: while others, though no doubt in widely different degrees, appear to be of general, perhaps nearly universal, operation. Foremost in the latter class, and constituting therefore in my opinion

Of removable causes of disease, the chief is uncleanliness:

Mortality in Massachusetts. 1869–73.

	Zymotic Diseases.		Acute Pulmonary Diseases.		Zymotic and Acute Pulmonary Diseases.		Phthisis.		Zymotic and Acute Pulmon. Dis. and Phthisis.	
	Under 5.	All Ages.	Under 5.	All Ages.	Under 5.	All Ages.	Under 5.	All Ages.	Under 5.	All Ages.
1869	4,232	6,898	753	2,068	4,985	8,966	317	4,659	5,302	13,625
1870	4,281	6,916	847	2,052	5,128	8,968	324	5,003	5,452	13,971
1871	4,068	6,554	846	2,228	4,914	8,782	301	5,070	5,212	13,852
1872	6,838	10,792	1,088	2,663	7,926	13,455	452	5,556	8,378	19,011
1873	6,604	9,721	1,014	2,515	7,618	12,236	357	5,556	7,975	17,792
Aggregate.	26,023	40,871	4,548	11,526	30,571	52,397	1,751	25,844	32,319	78,241

The total number of deaths in Massachusetts, during the five years, *from all causes*, was 156,289; of that number the deaths from zymotic diseases comprised twenty-six per cent; those from acute pulmonary diseases were seven per cent; and those from phthisis, seventeen per cent. So that, if we include all these among the "preventable" diseases, the deaths from these causes represent one-half the actual mortality.

I am, sir, yours respectfully,

F. W. Draper.

To Henry I. Bowditch, M.D.,
Chairman State Board of Health.

objects which claim earliest attention in the sanitary government of England, two gigantic evils stand conspicuous, —

First, the omission (whether through neglect or through want of skill) to make due removal of refuse-matters, solid and liquid, from inhabited places; and,

Secondly, the license which is permitted to cases of dangerous infectious disease to scatter abroad the seeds of their infection.

In certain very important cases, injury — immense injury — accruing to the public health, arises from a co-operation of these two evils: arises, namely, through the special facility which (as I shall presently illustrate) certain forms of local uncleanliness provide for the spreading of certain specific infections; and the influence which uncleanliness almost necessarily exerts in that way against the public health makes so large an addition to the influence which it exerts in other ways, that, in total power, uncleanliness must, I think, without doubt, be reckoned as the deadliest of our present removable causes of disease.

and particularly in the degrees which constitute Filth.

In stating this opinion of its fatal influence, I do not refer to it in its minor degrees, as compared with high standards of cleanliness or chemical purity, but refer chiefly to such

degrees of it as fall, or ought to fall, within the designation of FILTH: to degrees, namely, which in most cases obviously, and in other cases under but slight mask, are such as any average man or woman should be disgusted at: such as, eminently, the presence of putrescent refuse-matter, solid and fluid, causing nuisance by its effluvia and soakage. Also in imputing to Filth, as thus illustrated, that its effluvia are largely productive of disease, I do not ignore that disease is also abundantly caused by air which is fouled in other ways. Particularly I do not forget the effluvia of overcrowding; that, within dwellings which are populated beyond their means of ventilation, the foulness of air, due to the non-removal of the volatile refuse of the human body, is as strictly within the physiologist's definition of Filth, and as truly a nuisance within the scope of sanitary law, as any non-removal of solid or liquid refuse; but, for the purpose of my present observations, the question of overcrowding is something to be set aside as distinct, and the word "Filth" is therefore here used distinctively in that sense which suggests subject-matter for sewers and scavenging.

Old general knowledge of the hurtfulness of Filth

6. It has been among the oldest and most universal of medical experiences that populations, living amid Filth, and within direct reach of its polluting influence, succumb to various diseases which under opposite condi-

tions are comparatively or absolutely unknown; and the broad knowledge that Filth makes Disease is amply represented in the oldest records which exist of legislation meant for masses of mankind. The exacter studies of modern times have further shown that by various channels of indirect and clandestine influence (some of which I shall presently illustrate) Filth can operate far more subtly, and also far more widely and more destructively, than our forefathers conjectured. The later almost equally with the former knowledge, the finer almost equally with the more general, is indispensable for sanitary administration in modern times; and Filth is little likely to be guarded against with that thoroughness of detail which present science shows to be necessary, unless the detail follow some intelligent appreciation of the ways in which Filth becomes destructive. This more exact knowledge, though it owes its origin to medical observation, and will no doubt constantly be receiving additions from the same source, is such as at least all well-educated persons of the general public may be expected gradually to acquire and apply; and I believe that our newly instituted Medical Officers of Health will be rendering not their least service to the public, when they shall make their own possession of this branch of medical knowledge, and their consequent power of interpreting many obscure productions of disease, subservient to the education of the laity among whom they act.

7. An important suggestion of modern science with regard to the nature of the operations by which Filth, attacking the human body, is able to disorder or destroy it, is: that the chief morbific agencies in Filth are other than those chemically-identified stinking gaseous products of organic decomposition which force themselves on popular attention. Exposure to the sufficiently concentrated fumes of organic decomposition (as for instance in an unventilated old cesspool or long-blocked sewer) may, no doubt, prove immediately fatal by reason of some large quantity of sulphide of ammonium, or other like poisonous and fœtid gas, which the sufferer suddenly inhales; and far smaller doses of these fœtid gases, as breathed with extreme dilution in ordinary stinking atmospheres, both give immediate headache and general discomfort to sensitive persons temporarily exposed to them, and also appear to keep in a somewhat vaguely depressed state of health many who habitually breathe them: but here, so far as we yet know, is the end of the potency of those stinking gases. While, however, thus far there is only the familiar case of the so-called *common chemical poison*, which hurts by instant action and in direct proportion to its palpable and ponderable dose, the other and far wider possibilities of mischief which we recognize in Filth are such as apparently must be attributed to *morbific ferments* or *contagia;* matters which

Modern, more particular, knowledge of its modes of hurtful operation.

not only are not gaseous, but on the contrary, so far as we know them, seem to have their essence, or an inseparable part of it, in certain solid elements which the microscope discovers in them: in living organisms, namely, which in their largest sizes are but very minute microscopical objects, and at their least sizes are probably unseen even with the microscope; organisms which, in virtue of their vitality, are indefinitely self-multiplying within their respective spheres of operation, and which therefore, as in contrast with common poisons, can develop indefinitely large ulterior effects from first doses which are indefinitely small. Of ferments thus characterized, the apparently essential factors of specific chemical processes, at least one sort — the ordinary septic (putrefactive) ferment[1] — seems always to be present where putrefactive changes are in progress, as of course in all decaying animal refuse; while others, though certainly not essential to all such putridity, are in different degrees apt, and some of them little less than certain, to be frequent incidents of our ordinary refuse. As, apparently, it is by these various agencies (essential and incidental) that Filth produces "zymotic" (fermentative) disease, it is important not to confound them with the fœtid gases of organic decomposition; and the question,

[1] For convenience I use the singular number, but have no intention of implying that ordinary putrefactive changes have only one ferment which can be considered habitual to them.

what infecting powers are prevalent in given atmospheres, should never be regarded as a mere question of stink. It is of the utmost practical importance to recognize in regard of Filth, that agents which destroy its stink may yet leave all its main powers of disease-production undiminished. Whether the ferments of disease, if they could be isolated in sufficient quantity, would prove themselves in any degree odorous, is a point on which no guess need be hazarded; but it is certain that in doses in which they can fatally infect the human body they are infinitely out of reach of even the most cultivated sense of smell, and that this sense (though its positive warnings are of indispensable sanitary service) is not able, except by indirect and quite insufficient perceptions, to warn us against risks of morbid infection. Even as regards the positive notices which we receive by the sense of smell with regard to putrefactive decomposition, we must not assume that the diffusion and potency of septic ferment in the air necessarily go *pari passu* with the diffusion and offensiveness of the fœtid gases: — Witness, on a very large scale, the experience of London in the summer of 1858; when, as persons who were then frequenting Westminster may well remember, our tidal river, enormously charged with decomposing sewage, stank week after week in a degree which excited much public alarm as to the possible consequences of the nuisance, and even led to an immediate interference of the Legis-

lature ;[1] but when, though the quantity of sulphuretted hydrogen in the river-atmosphere was such as rapidly to blacken the ordinary chemical test-papers, as well as to affect in the same way the lead-paint of vessels on the river, and was enough also to produce among persons much engaged on the river such signs of sulphide-poisoning as I have above mentioned, the particular ailments which attest the working of septic ferment on the human body were in even less than average prevalence among the unwilling subjects of this large experiment.[2]

Filth-ferments in their relation to air:

It must be remembered that gases on the one hand, and the particulate ferments on the other, stand in widely different relations to air and water as their respective media of diffusion. The ferments, so far as we know them, show no power of active diffusion in dry air: diffusing in it only as they are passively wafted, and then probably, if the air be freely open, not carrying their vitality far: but, as moisture is their normal medium, currents of humid air (as from sewers and drains) can doubtless lift them in their full effectiveness, and, if into houses or confined exterior spaces, then with their chief chances of remaining effective: and

[1] See the word "speedily" in the preamble of the amending Metropolis Local Management Act, 21 & 22 Vict., c. 104.

[2] The particulars of this very interesting experience are given in my Second Annual Report to the Privy Council, pp. 54–6, in a paper for which I was indebted to Dr. Ord, now Senior Assistant Physician to St. Thomas's Hospital.

ill-ventilated low-lying localities, if unclean as regards the removal of their refuse, may especially be expected to have these ferments present in their common atmosphere, as well as of course teeming in their soil and ground water.

Considerations like some which I have stated in regard of infective air, apply equally to infective water. In the latter, just as in the former, the zymotic (fermentative) malignity is but indirectly and most imperfectly suggested to us by qualities which strike the common sense, or by matters which chemical analysis can specify. As any unbrutalized sense of smell will turn with disgust from certain airs, so will it, and common taste and sight, be repelled by certain waters; and as the chemist can show certain foulnesses in the one, so he can show certain foulnesses in the other; but these tests, it must always be remembered, are tests only of the most general kind. Confessedly they do not touch the *corpus delicti*, but only certain conditions to which it is or may be collateral; and their negative findings are consequently not entitled to the same sort of confidence as their positive. Chemical demonstration of unstable nitrogenous compounds in water is a warning which of course should never be disregarded; but till chemistry shall have learnt to identify the morbific ferments themselves, its competence to declare them absent in any given case must evidently be judged incomplete, and waters which chemical analysis would

and to water.

probably not condemn may certainly be carrying in them very fatal seeds of infection.

Excess of disease in filthy places not always due only to the Filth:

8. Populations under the influence of Filth are in many cases suffering not only from that influence, but also from other removable causes of disease; and in any endeavor to estimate at all exactly, as for administrative judgment, the injury which is derived from Filth, evidently those additional influences should, as far as practicable, be made matter of separate account. In one case, a filthy neighborhood may be so poor that mere privation is an appreciable cause of disease in it. In another case, the population may be so badly housed in respects which by themselves would not be classed as Filth, — may be so overcrowded in their dwellings, or be inhabiting such close or ill-built quarters, that this has to be counted as causing disease. In a third case, some particular collective occupation, injurious to the adults and adolescents who follow it, may be creating disease additional to that which the Filth produces. In a fourth case, swarms of infants and young children, whose mothers are engaged away from home in some local industry, may be suffering disease from neglect and mismanagement: and so forth. And evidently, if one would see what harm Filth can do in its own ways, one must discriminate it as far as possible from such concomitants as the above.

In filthy urban districts, where the foul air, comparatively incarcerated in courts and alleys and narrow streets, can act with most force in regard to masses of population, the population always shows an increased mortality under several titles of disease. Such miscellaneous increase of mortality affects probably all ages, more or less; but a distinctively large proportion of it attaches to the children. Apparently the mere influence of the Filth (apart from other influences) in such a district will be to cause the infants and young children to die at twice or thrice or four times their fair standard rate of mortality; and this disproportion, which becomes even more striking when the chief epidemics of ordinary childhood (measles and whooping-cough and scarlatina) are left out of the comparison, seems to mark the young lives as finer tests of foul air than are the elder and perhaps acclimatized population.

but notwithstanding mixed cases, the hurtfulness of the Filth is certain.

In trying to analyze the death-statistics of filthy districts, we soon find that, with regard to many of the separate elements in the miscellaneous mortality, we cannot argue in exact scientific terms: partly because very large quantities are registered under names which have no definite nosological meaning, — e.g., "convulsions," "teething," "atrophy," "consumption;" partly also because some kinds which we can fairly identify by name (e.g., pneumonia) are such as we do not always ætiologically[1] understand; and

[1] i.e., in their precise causes.

sometimes we may be only able to establish the broad fact that, within the area of Filth, the deaths, in total amount, are greatly more numerous than ought to be, and that the excess (or, in mixed cases, a certain share of the excess) can only be accounted for as the effect of the Filth. Though, when that broad conclusion is reached, more detailed conclusions may at first sight scarcely seem wanted for practical purposes, yet there is advantage in establishing the details of each case as exactly as the circumstances will allow; not only because it greatly concerns the progress of preventive medicine that all our attributions of cause and effect should be in the spirit of exact science, but also because, in regard to filthy rural districts, the argument from general death-rates would often be insufficient to carry conviction: and I therefore proceed to speak with some particularity of individual diseases which can be traced to Filth.[1]

Of diseases distinctively due to Filth, the most characteristic are the diarrhœal.

9. In all filthy districts, one particular class of diseases seems specially apt to stand in relief, — the diseases, viz., which, in respect of their leading symptom, may be

[1] I would note that, writing here on these diseases only for immediate practical purposes, I am obliged to leave unnoticed various of the more scientific aspects of the subject. As I must thus leave undiscussed the very interesting question of the influence of particular soils and seasons in favoring epidemics of Filth-Disease, I would the more especially refer to the very valuable and suggestive writings of Professor v. Pettenkofer, of Munich, on this branch of the study of Cholera and Enteric Fever.

generalized as diarrhœal. These diseases, in their relation to Filth, deserve very special attention, — first, on their own account, as extremely large causes of death; and, secondly, because an exact knowledge of their method of production is likely to throw comparative light on the pathology of obscurer filth-diseases.

Common diarrhœa, and its relation to Filth.

A certain large quantity of endemic (i.e., arising from some local influence) diarrhœa is medically spoken of as "common," in contrast with such so-called "specific" diarrhœal diseases as cholera and enteric (typhoid) fever. Perhaps, in a certain sense, all might equally claim to be called "specific;" since, no doubt, each distinct effect has essentially its own distinct cause: but at least provisionally the contrast of terms is convenient, because much "common" filth-produced diarrhœa (with perhaps much else of the miscellaneous mortality of the same districts) may reasonably be ascribed to infection with the "common" septic ferment which is an attribute of all filth. Among the effects which arise under experimental septic (putrefactive) infections, as likewise in cases of accidental septicæmia (putridity of the blood) in the human subject, acute catarrh of the mucous membrane of the intestines is an extremely prominent fact. The mucous membrane of the intestinal canal seems peculiarly to bear the stress of all accidental putridities which enter the blood. Whether they

have been breathed or drunk or eaten, or sucked up into the blood-vessels from the surface of foul sores, or directly injected into blood-vessels by the physiological experimenter, there peculiarly the effect may be looked for: just as wine, however administered, would "get into the head," so the septic ferment, whencesoever it may have entered the blood, is apt to find its way thence to the bowels, and there, as universal result, to produce diarrhœa.

Enteric fever and its relation to excremental infection.

10. It seems certain, however, that in the high diarrhœal mortality of filthy places, infections, of the sorts already recognized as "specific," exercise always a very great influence: and in the studies which have made a basis for the suggestions of preventive medicine in relation to Filth, none have hitherto been so instructive as the study of these "specific" filth-infections. To them I would now particularly advert; referring first to the disease which of late years has for sufficiently sad reasons become well known to the public of this country under the name of Enteric or Typhoid Fever.

Since the year 1849, when Dr. (now Sir William) Jenner made known his conclusive and masterly discrimination of this specific form of fever, successive studies have tended with singular uniformity to connect it, in regard of its origin, with nuisances of an

excremental sort.[1] In illustration of that fact in the natural history of enteric fever, I may refer to an abstract which I append of the experience of the Medical Department during the four years 1870–73 in this particular branch of disease-production: and such illustrations might be multiplied to any desired extent. The experience is, not only that privies and privy-drainage, with their respective stinkings, and soakings, and the pollutions of air and water which are thus produced, have in innumerable instances been the apparent causes of outbreaks of enteric (typhoid) fever, but, further, that they have seemed capable of doing this mischief in a doubly distinctive way: first, as though by some aptitude which other nuisances of organic decomposition, though perhaps equally offensive, have not seemed equally or nearly equally to possess; and secondly, as though this specific property, so often attaching to them in addition to their common septic unwholesomeness, were not, even in them, a fixed property. The explanation of this experience, the explanation of the frequent but not invariable tendency of privy-nuisances to infect with enteric fever, has seemed to consist in the liability of such nuisances to carry with them, not invariably, but as frequent accidental adjuncts, the "specific" contagium of any prevailing bowel-infec-

[1] The very able writings of Dr. Murchison, dating from a paper by him in the Medico-Chirurgical Transactions of 1858, have been of particular influence in that contention.

tion: for, presumably, the privies of a population receive, with various other things, the diarrhœal discharges of the sick; and it has long been matter of fair pathological presumption that in any "specific" diarrhœa (such as eminently is enteric fever) every discharge from the bowels must teem with the contagium of the disease.[1] Medical knowledge in support of this presumption has of late been rapidly growing more positive and precise; and at the moment of my present writing I have the gratification of believing that it has received an increase which may be of critical importance, in a discovery which seems to give us for the first time an ocular test of the contagium of enteric fever: in the discovery, namely, of microscopical forms, apparently of the lowest vegetable life, multiplying to innumerable swarms in the intestinal tissues of the sick, penetrating, on the one hand, from the mucous surface into the general system of the patient, and contributory, on the other hand, with whatever infective power they represent, to the bowel-contents which have presently to pass forth

[1] This is the argument of the late Dr. John Snow: which, though urged by him more particularly in relation to Asiatic Cholera, was meant by him to have general application, and was expressly applied by him to enteric fever. In the latter relation it has from seventeen years ago been constantly and very powerfully urged by Dr. William Budd, of Clifton. From the beginning of our European experiences of cholera the doctrine of the specific infectiveness of the discharges in the disease had been argued by Dr. Von Gietl of Munich, to explain, as he maintained, the atmospheric diffusion of the epidemic influence.

from him.[1] Adverting then summarily, in an administrative point of view, to the present state of medical knowledge and opinion as to the way in which enteric fever spreads its infection in this country, I would say that it is difficult to conceive, in regard to any causation of disease in a civilized community, any physical picture more loathsome than that which is here suggested: that apparently, of all the diseases which are attributable to Filth, this, as an administrative scandal, may be proclaimed as the very type and quintessence: that, though sometimes by covert processes which I will hereafter explain, yet far oftener in the most glaring way, it apparently has an invariable source in that which of Filth is the filthiest: that apparently its infection runs its course, as with successive inoculations from man to man, by instrumentality of the molecules of excrement which man's filthiness lets mingle in his air and food and drink.

11. It seems certain that the distribution in England of an immense quantity of other specific disease must exactly follow that disgusting type. The local affinities of

Cholera and its relation to excremental infection.

[1] This discovery (as I believe it to be) of the microphyte of enteric fever is the work of Dr. Klein, Assistant-Professor in the Brown Institution, and arose in one of the "Scientific Investigations in aid of Pathology and Medicine," which I have the honor of superintending. The details of the subject are still undergoing investigation at Dr. Klein's hands.

Asiatic Cholera, when present in this country, have always been so close to those of enteric fever, in respect of its association with circumstances of excremental filth, and the lines of pathological argument on this association (even apart from evidence which has been alleged on the direct communicability of cholera to the lower animals) are so parallel in the two cases, that no reasonable doubt can, I think, be entertained as to the substantial dependence of cholera-epidemics in this country on the opportunities which are ever widely open for the above-described filthy method of infection. Indeed, with regard to the manner of spread of the entero-zymotic (intestinal putrefactive) diseases generally, it deserves notice that the whole pathological argument which I am explaining grew among us in this country out of the very cogent facts which our cholera-epidemics specially supplied, and to which the late Dr. John Snow, twenty-five years ago, had the great merit of forcing medical attention: an attention at first quite incredulous, but which, at least for the last fifteen years, as facts have accumulated, has gradually been changing into conviction.

Similar relation of other diseases.

12. The argument which applies to the bowel-discharges of Cholera and Enteric Fever, and which, in regard of them, rests on a very large quantity of detailed evidence, seems to extend by extremely strong analogy to every disease, whether

nominally "common" or "specific," in which the human intestinal canal is the seat of infected changes: chiefly perhaps to such diarrhœal and dysenteric infections as are exclusively or distinctively intestinal, but likewise, I apprehend, more or less, to every general infection (such, for instance, as scarlatina) in proportion as it inclusively infects the bowels: and it would thus seem probable that air and water, having in them the taint of human excrement, must often carry with them, whithersoever they pass, the seeds of current morbid infections.

Powers of common septic (putrefactive) infection to produce disease.

13. But though hitherto, for convenience of argument, I have referred specially to the influence of human excrement in determining the spread of "specific" infections from man to man, and provisionally as if man's body were the sole birth-place of the several contagia which afflict his kind, assuredly that intermediary influence is but part, and it may be but a very subordinate part, of the faculty by which Filth produces disease. While it is indeed true as regards some contagia that at present we know them only as incidents of the human body, wherein we see them in case after case multiplying their respective types with a successivity as definite and identical as that of the highest orders of animal or vegetable life, — and while thus it is at present true, for instance, of smallpox or syphilis, that a case arising independently

of a previous like case is hitherto practically as unknown to us as the parentless production of dog or cat, our knowledge with regard to other very important contagia is growing to be of larger scope. I would mention it as among the most hopeful advances of modern preventive medicine, that some diseases, which, in the sense of being able to continue their species from man to man, are apparently as "specific" as those which I have above named, seem now beginning to confess in detail a birth-place exterior to man, a birth-place amid controllable conditions in the physical nature which is around us, a birth-place amid the "common," putrefactive changes of dead organic matter. Referring again now to what I have not pretended to be able to analyze in detail — the excess of miscellaneous, and in great part nominally "common," disease in filthy neighborhoods, I would particularly wish to connect with that subject a reference to our growing scientific knowledge in the matter of the "common" septic ferment. The pathological studies of late years, including eminently certain very instructive researches which Professor Sanderson has conducted, have clearly shown that in the "common" septic ferment, or in some ferment or ferments not hitherto to be separated from it, there reside powers of disease-production as positive, though not hitherto as exactly defined, as those which reside in the variolous and syphilitic contagia. Experimentally we know of this ferment, that, when it is enabled by

artificial inoculations to act in its most effective way on the animal body, and even more when it has received a curious increment of strength which its first propagation within the living body seems to bestow on it, it shows itself one of the most tremendous of zymotic poisons. It rapidly in the one animal body develops disease which then is communicable to another: febrile disease, with inflammations numerous and intense, and including in marked degree one of the acutest known forms of intestinal inflammation and flux; disease exactly corresponding to certain very fatal and unfortunately not infrequent infections to which lying-in women, and persons with accidental wounds and the wounds of surgical operations, are most subject, but which also sometimes occur independently of such exceptional states; infections, chiefly known under the names of erysipelas, pyæmia (pus in the blood), septicæmia, (putridity of the blood), and puerperal fever; infections, which we sometimes see locally arising anew in unquestionable dependence on Filth, but of some of which, when arisen, it is perfectly well known that they are among the most communicable of diseases. And a further, perhaps still more instructive teaching of the artificial infections is this: that the "common" ferment, which in its stronger actions quickly destroys life by septicæmia, can in slighter actions start in the infected body chronic processes which will eventuate in general tubercular disease. I need hardly point

out that the above facts, extremely suggestive though they are, must of course, in relation to my main argument, be applied only under certain reserve; that evidently the exact conditions of the physiological experiment are not reproduced in ordinary life; and that against the common septic ferment, as presented in fouled atmosphere or fouled drinking water, the living human body in its normal state can apparently make considerable (though presumably not unlimited) resistance. But after all such reserves the truth remains, that, looking well at the pathology of human life under residence in foul air, we find ourselves again and again reminded of these results of physiological experiment: often seeing phthisis and other tubercular and like diseases gradually developed, as though under gradual overpowering of the limited normal resistance to the septic ferment; or seeing — and particularly where some exceptional bodily state (wounded or puerperal) gives opportunity, the sudden invasion of erysipelas or other septic infection, not in discoverable dependence on any human infectant, but conceivably a filth-inoculation from the air.[1] The line of reflection thus suggested is one which I cannot now follow further, but of which the practical interest seems to be extremely great. For, while the excessive pro-

[1] See in Sixth Report to the Privy Council, pp. 58–64, observations on the so-called "traumatic infections" in their relations to Hospital Hygiene.

duction of fatal disease in filthy neighborhoods is a fact as to which there can be no doubt, and of which the immediate significance is deplorable, the ulterior suggestion is this: that so far as Filth in any instance produces anew such a disease as erysipelas or puerperal fever on the one hand, or phthisis or other tubercular disease on the other, the mischief first done is of a sort which entails certain possibilities of extension: such, namely, that in the one instance by accidental contagion, as in the other instance by hereditary transmission, it may, for aught we know, indefinitely extend beyond the sphere in which Filth first produced it.

II.

14. Having in the above statements explained what I believe to be the present knowledge of my profession with regard to the diseases which Filth is apt to produce in the human body brought under its influence, and with regard therefore to the exact dangers which each prevalence of Filth implies, I now turn to the more administrative aspects of the matter, and may begin by referring to the chief forms in which Filth is apt to be about us.

Forms in which Filth is found producing disease:

15. There are houses, there are groups of houses, there are whole villages, there are considerable sections of towns, there are

Filth operating where it stands:

even entire and not small towns, where general slovenliness in every thing which relates to the removal of refuse-matter, slovenliness which in very many cases amounts to utter bestiality of neglect, is the local habit: where, within or just outside each house, or in spaces common to many houses, lies for an indefinite time, undergoing fœtid decomposition, more or less of the putrefiable refuse which house-life, and some sorts of trade-life, produce: excrement of man and brute, and garbage of all sorts, and ponded slop-waters: sometimes lying bare on the common surface; sometimes unintentionally stored out of sight and recollection in drains or sewers which cannot carry them away; sometimes held in receptacles specially provided to favor accumulation, as privy-pits and other cesspools for excrement and slop-water, and so-called dust-bins receiving kitchen-refuse and other filth. And with this state of things, be it on large or on small scale, two chief sorts of danger to life arise: one, that volatile effluvia from the refuse pollute the surrounding air and every thing which it contains; the other, that the liquid parts of the refuse pass by soakage or leakage into the surrounding soil, to mingle there of course in whatever water the soil yields, and in certain cases thus to occasion the deadliest pollution of wells and springs. To a really immense extent, to an extent indeed which persons unpractised in sanitary inspection could scarcely find themselves able to imagine, dan-

gers of these two sorts are prevailing throughout the length and breadth of this country, not only in their slighter degrees, but in degrees which are gross and scandalous, and very often, I repeat, truly bestial. And I state all this in unequivocal language, because I feel that, if the new sanitary organization of the country is to fulfil its purpose, the administrators, local and central, must begin by fully recognizing the real state of the case, and with consciousness that in many instances they will have to introduce for the first time, as into savage life, the rudiments of sanitary civilization.[1]

16. A second point, which equally with the above needs to be recognized by all who are responsible for the prevention of Filth-Diseases, is: that Filth does not only infect where it stands, but can transmit its infective power afar by certain appropriate channels of conveyance; that, for instance, houses which have unguarded drainage-communication with cesspools or sewers may receive through such communication the same filth-infections as if excrement stood rotting within their walls; and that public or private water-reservoirs or water-conduits, giving accidental admission to filth, will carry the infection of the filth whithersoever their outflow reaches. Thus it has again and again happened that an individual house, with every apparent cleanliness

Filth operating at a distance.

1 These remarks are as applicable to Massachusetts as to England. — Am. Ed.

and luxury, has received the contagium of enteric fever through some one unguarded drain-inlet; or that numbers of such houses have simultaneously received the infection, as an epidemic, in places where the drain-inlets in general have been subject to undue air-pressure from within the sewer. And thus equally on the other hand it has again and again happened that households, while themselves without sanitary reproach, have received the contagium of enteric fever through some nastiness affecting (perhaps at a considerable distance) the common water-supply of the district in which they are.[1]

Chief sources of excremental infection illustrated.

17. When an epidemic of enteric (typhoid) fever, or of cholera or diarrhœa, has been traced (as in general it quite easily can be) to some gross excremental pollution of air or water, the primary source of such pollution will usually be under one or more of the following three heads, viz., faults of public sewerage, faults of indoor water-closets and other apparatus of house-drainage, and the fault of bog-privies.

[1] For illustrations how the infection of houses with Filth-diseases (and specially with enteric fever) is promoted by imperfect ventilation of sewers, I may refer to the case of Windsor, which I gave in my first Annual Report to the Privy Council, p. 16, or to the cases of Croydon and Worthing which Dr. Buchanan describes in appendix to my Ninth Report, pp. 103 and 195; and of course these illustrations of infection on an epidemic scale would appply *à fortiori* to individual cases where the drain-inlets of houses are left untrapped. To illustrate the relations of polluted public water-supplies to the dissemination of cholera and enteric fever, I may refer to the collection of cases which I gave in my Twelfth Report.

18. The public sewerage may be at fault in either of two ways: first, in absence of sewers, so that slop-waters and other liquid filth, if not disposed of on the private premises, have to pass without proper tubular conveyance along public ways, either free on the general surface, or in open and generally very irregular channels meant only for rain-water, where necessarily they must more or less stagnate and stink and soak: secondly, in the existence of sewers which in themselves are more or less mischievous. (1.) In regard of sewerage;

With regard to non-provision of sewers in inhabited areas, apparently there often is an assumption that sewers may properly be dispensed with in cases where water-closets are not in use; that sewers (i.e. public drains of tubular type) are only wanted where the intention is to convey privy-refuse; and that, for the mere slop-waters of the population, the open way-side gutters which are meant for rain-water will suffice. This assumption can only rest on ignorance of what "slop-waters" really are, in respect of the filth which is contained in them; and its wrongness is sufficiently evident to any one who observes how extremely offensive are in general such way-side gutters as are allowed to receive liquid refuse from groups of houses. Such refuse at its worst is a very condensed form of sewage, and even at its best is such as cannot without nuisance be let loiter and soak by the way- (*a.*) want of sewers;

side. As soon as the point is passed at which houses can be expected to dispose of their own liquid refuse on their own ground, the point is reached at which proper public channels for the conveyance of such refuse should be provided; and the irregular way-side channels which may perhaps quite properly suffice for rainfall, cannot, I apprehend, in relation to slop-waters, be deemed such "sufficient sewers" as the law requires local authorities to provide.

(*b.*) faults in sewers;

Demerits in existing sewers can in some essential respects be judged by common observation. As the object of a sewer's existence is to prevent the stagnation of filth in and about houses and frequented places, and to guard against the dangerous pollution of air and soil which the filth, if not effectually conveyed away, must occasion, so, of course, any sewer which itself occasions any such stagnation and pollution is (in proportion as it does so) unsuccessful; and a sewer which stinks at its open gratings is, *pro tanto*, giving evidence of such unsuccess. The indispensable conditions of success in a sewer are, first that the flow of sewage to its outfall shall be, as perfectly as possible, continuous and complete and scouring, not ponded and leaking and depositing; and secondly, that the sewer shall have perfect ventilation. A sewer in which these conditions are fulfilled will scarcely, if at all, under ordinary circumstances, cause appreciable odor at open (untrapped) gullies in the street; the air in

it, if at times compressed, will not easily exert at the duly guarded inlets of house-drains any such pressure as can make way for it into houses; and in cases where accidental defects of house-drains unfortunately permit sewer-air to enter houses, the sewer-air will be at its lowest degree of dangerousness. It is a great security for such perfect ventilation of sewers as is essential to the safety of houses, that, in addition to whatever special ventilating-shafts are provided, street-gullies should, as far as practicable, be left untrapped: and complaint of nuisance from any such gullies should not necessarily be taken as reason for trapping them. In case of such complaint, the presumption is that from original ill-construction or some other cause the sewer does not properly fulfil its object, but has filth accumulated and stagnant in it as in a cesspool, and has its ventilation at least relatively in defect; and the nuisance which such a sewer occasions in the public way, is far less important than the risk incurred by the inhabitants of houses which drain into the sewer. Merely to trap street-gullies in any such case would be greatly to increase the danger to houses; the use of charcoal trays in gullies, in the hope to disinfect their effluvia, has repeatedly proved dangerous in the same way: and I accordingly think it an essential principle, that the evil of a stinking sewer should always be dealt with at its root. Thus, a sewer which is imperfectly ventilated should have perfect ventilation provided

for it; a sewer which, though fairly constructed, is from poorness of current not completely self-scouring, should at due intervals have extrinsic flushing: and sewers which, with radical ill-construction, are virtually but cesspools under the street, should without delay be abolished.

(2) In regard of house-drainage and water-closets.

19. Secondly, a very large danger to the public health, and particularly to the better-off classes of society, has of late years consisted in the recklessness with which house-drains, receiving pipes from water-closets, sinks, cisterns, baths, &c., in the interior of houses, and often actually within bedrooms or the adjoining dressing-rooms, have been brought into communication with sewers. Among architects and builders there seems to have been very imperfect recognition of the danger which this arrangement must involve, in event either of unskilful first construction or of subsequent mismanagement or want of repair. Then, in regard of construction, an almost unlimited trust has been placed in artisans who not only could hardly be expected to understand certain of the finer conditions (as to atmospheric pressure) which they had to meet, but who also in not a few instances have evidently failed to apprehend that even their mechanical work requires conscientious execution. Under influence of the latter deficiency there have been left in innumerable cases all sorts of escape-holes for sewer-

effluvia into houses, and disjointed drains effusing their filth into basements: while under the other deficiency, house-drainage, though done with good workmanlike intention, has often, for want of skilled guidance, been left entirely without exterior ventilation, and sometimes has in addition had the over-flow pipes of baths or cisterns acting as sewer-ventilators into the house: and all this not infrequently in places where the sewer itself, from which so much air has been invited, has been an ill-conditioned and unventilated sort of cesspool. It is almost superfluous to say that under circumstances of this sort a large quantity of enteric fever has been insured; and I should suppose that also a very large quantity of other filth-disease must have sprung from the same cause. Then there has been the vast quantity of interior air-fouling which arises from mismanagement of drain-inlets, or from non-repair of worn-out apparatus: as when sink-traps, injudiciously made movable, have been set aside; or when pipes under temporary disuse, having evaporated all water from their traps, or leaden closet-pipes, with holes corroded in them, have been left fouling the house with a continuous eructation of sewer-air.[1] Again, in poor

[1] Dr. Andrew Fergus, of Glasgow, in papers of much sanitary interest, contributed by him to the Edinburgh Medical Journal (February 1872 and February 1874), adduces evidence to show that the ordinary corrosion of leaden pipes from closets and sinks is a chemical effect of sewer-air, and that it goes on with greatly increased rapidity in cases where the pipes are unventilated.

neighborhoods, water-closets have in many cases been constructed with scanty and ill-arranged water-service to flush them, or have even been left to only such flushing as the slop-water of the house, or other water thrown in by hand, might give: and again and again these ill-watered and often obstructed closets have been found acting on a large scale as causes of disease. Again, a different sort of danger, and one which seems capable of wide operation, has been seen to arise where water-closets receive their flushing-service from the mains of a so-called "constant" supply: for supplies called constant must not only sometimes intermit for purposes of necessary repair, but also in some cases are habitually cut off during the hours of night; and the danger is that, during times of intermission, if there be not service-boxes or cisterns between the privy-taps and the mains, privy-effluvia and even in some cases fluid filth will be (so to speak) sucked from closet-pans into water-pipes. This danger, which hitherto has been little known to the public, but which it is important to have well understood, is illustrated by two remarkable reports, respectively by Dr. Blaxall and Dr. Buchanan, on outbreaks of enteric fever thus occasioned. Dr. Blaxall's report (App. No. 2) is of particular interest, as it represents, I believe, our first departmental discovery of this cause of disease in actual operation;[1]

[1] I am glad to note, as corroboration from a source which I highly esteem, that, while Dr. Blaxall was recording the observations which

and Dr. Buchanan's (App. No. 3) seems to me of remarkable value, not only as being in itself a model of exact ætiological inquiry, but as illustrating the filth-causation of enteric fever, clandestinely effected, under circumstances where *primâ facie* any filth-disease would have seemed impossible.[1]

20. Thirdly, while it cannot be denied that ill-devised and ill-managed water-closets and their accompaniments have caused (and particularly among the better-off classes of society) filth-diseases to a very large extent, a far larger range of mischief throughout England has attached to the other kinds of privy-arrangement: and of all the filth-influences which prevail against human life in this country, privies of the accumulative sort operate undoubtedly to far the largest extent. (3.) in regard of accumulative privies.

The intention and, where realized, the distinctive

he had made at Sherborne in evidence of the above mode of production of enteric fever, Dr. Alfred Carpenter, of Croydon, was recording independent observations which he had made in that town to the same effect. See "Public Health," July, 1873.

[1] We cannot reprint these admirable reports because of their length. The peculiar points of Dr. Buchanan's were as follows. — Am. Ed.

A very severe epidemic of typhoid fever occurred at Caius College, Cambridge, where only a few years ago the most thorough and presumably complete system of water supply and of sewerage had been introduced. After a long investigation one valve, which should have been vertical in order to be influenced by gravity, was found to be placed horizontally in one of the pipes. By this error the drinking water had been contaminated with sewerage containing the contagium of typhoid fever.

By what standard should they be judged?

merit of a system of water-closets is, that in removing excremental matters from a house it does so with perfect promptitude, and in a perfectly neat and complete manner, not having any intervals of delay, nor leaving any residue of filth, nor diffusing any during its operation; and where the water-system is not in use, these objects ought still as far as possible to be secured. Thus, in the absence of water-closets, evidently any reasonable alternative system ought to include the following two factors, brought into thoroughly good mutual adjustment: first, proper catchment-apparatus in privies; and secondly, proper arrangements for privy-scavenage. The essential conditions of a proper catchment-apparatus are that it, as well as all adjacent underworks of the privy, shall as far as practicable be unabsorbent; that it shall absolutely preclude soakage or leakage of filth into soil or buildings or water; that it shall not admit rainfall or slop-waters; that it shall be so limited in size as not to allow of any needlessly offensive accumulations of matter; and that, whether movable or fixed, it shall easily admit of thorough cleansing. The essential conditions of proper privy-scavenging are, that it shall be strictly methodical; that from beginning to end it shall be so conducted as to occasion the least possible nuisance, public or private; that its performance shall be at such short intervals as invariably to precede the putrefaction of the excrement; and that there shall be associated with

it all such acts of thorough cleansing as the catchment-apparatus and other underworks of the privies may require. Further, in order that the fulfilment of these conditions may be possible, it is essential that the location and approaches of the privy should be definitely adapted to acts of scavenage.

Now, hitherto, in places not having water-closets, the general practice has flagrantly contravened those conditions. Either it has had no other catchment-apparatus than the bare earth beneath the privy-seat, and has trusted that this (receiving the excrements and often also the house-slops on to its natural surface or into a hole dug into it) would absorb and drain away the fluid filth, and serve during months and years as heaping-place for the remainder; or else it has had, as supplement to the privy, a large enclosed midden-stead or cesspool, partly or entirely of brickwork or masonry, intended to retain large accumulations of at least the solid filth, with or without the ashes and other dry refuse of the house, and in general dividing its fluid between an escape-channel, specially provided, and such soakage and leakage in other directions as the construction has undesignedly or designedly almost always permitted. Privies, such as these, have not been meant to have their filth removed except when its mere largeness of bulk (exceeding or threatening to exceed the limits of the privy-pit or cesspool or midden) might mechanically

Their actual relation to that standard.

make removal necessary, or else when there might happen to arise an agricultural opportunity for the stuff; and public scavenging in relation to such privies has either had no existence, or has been adapted to the supposition of an indefinite local tolerance of accumulation. All this accumulation, with its attendant exhalation and soakage, and at intervals the shovelling and carting away of its masses of fœtid refuse, and the exposure of the filth-sodden catchment-surfaces of privy-pits and middens, has been, as needs hardly be said, an extreme nuisance to those in whose vicinity it has been; and sometimes with the aggravating condition that, because of the situation of the privy, each filth-removal must be through the inhabited house. What nuisance this system at present constitutes in innumerable populous places, including some of our largest towns, can indeed hardly be conceived by persons who do not know it in operation; and the infective pollutions of air and water-supply, which it occasions to an immense extent in towns and villages throughout the country, are chief means of spreading in such places some of the most fatal of filth-diseases.

Excremental infection which has caused disease may require careful search to expose it:

21. Such are the three heads, under one or more of which will commonly be found the true explanation of outbreaks and prevalences of entero-zymotic (intestinal-putrefactive) disease in the different districts of this

country; and outbreaks which from time to time have arisen in seeming dissociation from such causes as I describe have again and again, under minute examination, resolved themselves into new illustrations of the general rule. For administrative reasons it is highly important that cases which seem exceptional should be thoroughly studied; and especially as regards enteric fever (because it apparently obeys so very sharply defined a rule of causation) I would advocate the strictest scrutiny of any origination which may seem not to have been excremental. Present knowledge seems very positively to say that the degree and extent in which enteric fever shall remain unexterminated from England will express the degree and extent in which sanitary administration shall have failed in rudimentary duties; and since, in particular local applications of this test, the prevalence of enteric fever in any district will *primâ facie* impugn the sufficiency of the local administration, it becomes of the more importance that the habits of the disease should be well understood, and that every mystification of unexplained facts should as far as possible be removed. An unexplained outbreak of enteric fever will sometimes mean (as in the very instructive case reported in my App. No. 5) that the locality where the disease occurs has had in it, as its own local property, some curiously unsuspected liability to filth-infection; but on the other hand there are circumstances under

as in case reported in App. No. 5;

which the excremental nuisance of one district may exceptionally do its mischief in another. This possibility might of course be illustrated by any such conductions of filth as I have noted in a former passage of these observations; but I wish here to draw particular attention to the possibility, now well established, of filth-infection being transmitted even on a large scale from district to district in particular articles of food, and especially in the article of milk. In 1870, Dr. Ballard, now of this Department, but who at that time was working with high character as Officer of Health for the parish of Islington, was able to show that an outbreak of enteric fever, which had attacked in ten weeks seventy families and one hundred and seventy-five persons in part of his district, coincided with the use of milk supplied from a particular dairy, where shortly before the outbreak there had been cases of enteric fever, and where apparently the infected house-drainage must have had easy access to an under-ground water-tank on the premises. There could be little reasonable doubt as to what in this epidemic had been the infectant; and since Dr. Ballard's connection with this Department it has twice happened to him to be able very clearly to trace the same method of infection at work in considerable outbreaks of enteric fever which he has been investigating; one in 1872 at Armley in the borough of Leeds, the other in 1873 at Moseley and Balsall

and in various epidemics produced by infected milk supply.

Heath, near Birmingham. A like case on a very large scale, and in some respects of unique interest, occurred also last year in London, chiefly in and about Marylebone, and was investigated elaborately by Mr. Netten Radcliffe, assisted in some stages of the inquiry by Mr. Power. A special interest of this case, as regards the point to which I have been adverting, is that here a great outbreak of enteric fever occurred at a distance of forty or fifty miles from the sanitary jurisdiction in which its true cause was contained; and the case is of the more value because the outbreak, as it happened to be in London, and happened also to have struck at its first blow in the houses of more than a dozen physicians and surgeons, had from the first its circumstances very attentively noticed by an unusual number of competent observers, deeply interested in a right knowledge of them. I subjoin (App. Nos. 4–6) the instructive reports which relate to these three epidemics of enteric fever, respectively referable to supplies of milk. There is in each case every reason to believe that the epidemic was due to excremental pollution of the dairyman's well; and it is solely in that point of view that I here insist on the cases. How the dairyman's water was enabled to spread its influence to his milk, and by what proportionate admixture it did so, are questions of little importance to my present subject-matter. The essential point is, that the water with which a dairyman washes his

pails, and of which a very variable quantity may under varying circumstances remain in them as an addition to his milk, is not likely to be of better quality than that which he and his local sanitary authority consider good enough for his own drinking; and that, in regard of this and many like possibilities of casual filth-infection, the general public are in intimate sanitary partnership with various of their purveyors of food.

III.

22. In order to the prevention of Filth-Diseases, the prevention of Filth is indispensable. Truism though this may seem, I think it needs to be expressly insisted on, as against any belief that districts, allowed to become filthy, can off-hand be made wholesome by disinfectants. To chemically disinfect (in the true sense of that word) the filth of any neglected district, to follow the body and branchings of the filth with really effective chemical treatment, to thoroughly destroy or counteract it in muck-heaps and cesspools, and ashpits, and sewers, and drains, and where soaking into wells, and where exhaling into houses, cannot, I apprehend, be proposed as physically possible; and the utmost which disinfection can do in this sense is apparently not likely to be more than in a certain class of cases (see § 39) to contribute something collateral and supplementary

To prevent Filth-Diseases, Filth must be prevented.

Disinfectants can only give a very subordinate assistance.

to efforts which mainly must be of the other sort. This opinion, as to the very limited degree in which chemistry can prevail against arrears of uncleanliness, does not at all discredit the appeals which are constantly and very properly made to chemistry for help in a quite different sphere of operation; with regard, namely, to the management of individual cases of infectious disease, and to the immediate disinfection of every thing which comes from them.[1] In this latter use of disinfectants, every thing turns on the

[1] As regards certain procedures on a small scale, we know that, with well-circumscribed matter to work upon, and with chemical action precisely adjusted to its task, we can absolutely kill any given contagium. Taking, for instance, a bit of glass which has on it a charge of vaccine or variolous matter, we know that, if we *sufficiently* heat it in the flame of a lamp, or *sufficiently* treat it with certain strong officinal chemicals which act in a like manner, we annihilate the power of infection; and we know that, in the sick-room where lies a patient with any dangerous infectious disease, — say diphtheria, small-pox, or enteric fever, we can to some extent imitate the above acts. Provided that real skill shall direct, and real conscientiousness shall execute, what has to be done, every tangible discharge which passes from the patient, every sheet or towel or handkerchief which any discharge from him has fouled, can be treated with heat or other disinfectant in a way to give at least comparative security against any outward spreading of his infection. It is greatly to be hoped that, with time and with progress of general education, the systematic doing of such acts as these will in each sick-house be considered an imperative duty of good citizenship, and may at last be so fully understood in that light as to be made, as far as practicable, an obligation at law: for disinfection in that sense (however remote we may now be from any sufficient adoption of it) would undoubtedly, if adopted, make chemistry an important ally to cleanliness in combating the filth-diseases of England; but such disinfection, the whole value of which is in its precision, differs diametrically from the pretended district-disinfections to which my text refers.

accuracy and completeness with which each prescribed performance is done; but such accuracy and completeness are of course only to be insured where operations are within well-defined and narrow limits; and in proportion as disinfection pretends to work on indefinite quantities or in indefinite spaces, it ceases to have that practical meaning. Again and again in the experience of this department a district has been found under some terrible visitation of enteric fever, from filth-infection operating through house drains or water-supply; but with the local authority inactive as to the true cause of the mischief, and only bent on practising about the place, under name of disinfection, some futile ceremony of vague chemical libations or powderings. Conduct such as this, referring apparently rather to some mythical "epidemic influence" than to the known causes of disease, and savoring rather of superstitious observance than of rational recourse to chemistry, is eminently not that by which filth-diseases can be prevented; and, contrasting it therefore with means by which that result can be secured, I would here specially note a warning against it.

The essential preventive is cleanliness;

23. In order to reduce that vast quantity of preventable disease which has its type in enteric fever, and in relation to which each individnal case of enteric fever which occurs ought to be regarded as having an important local

significance, the one essential condition is CLEANLINESS. That local sanitary authorities, proceeding to act upon this principle, with a clear intelligence of what cleanliness really means, and with sincere resolution to enforce it in their respective districts, can within a few years reduce by some tens of thousands the annual mortality of England, is, I think, at least so certain as that such ought to be the aim of their existence.

24. The perfection of cleanliness would be that all refuse-matters should from their very beginning pass away inoffensively and continuously: and the principles of approximation to that ideal must evidently be, first to provide to the largest practicable extent for the continuous outflow of refuse as fast as produced, and secondly (so far as continuous outflow cannot be got) to provide for the closest possible limitation and the completest possible innocuousness of such refuse as is unavoidably detained. Rules like these present themselves as mere transcripts from Nature to those who know as physiologists how the animal body, in its individual working, deals with the refuse of its own vital actions: and the individual body, hindered in its respiration or other excretory acts, may serve to picture the inevitable unhealthiness of any community, whether large or small, which lets its decaying refuse-matters gather about it.

in the highest degree in which it can be attained.

25. Wherever human beings are settled for residence, the cleanliness which is indispensable for healthy life can only be secured by strict method. Even where houses stand single and with wide space around them, the householder cannot safely neglect that sanitary obligation in regard of the refuse of his one household: the slop-waters, the cooking-waste, the various house-sweepings, the human fæces and urine, the excrements of domestic animals, &c.: and the obligation becomes more and more important in proportion as dwellings are gathered together on comparatively small areas.

Cleanliness not possible for communities, except with method and organization for certain collective services.

The law does not allow any holder of premises, whether in town or country, to neglect that obligation to any injurious extent; and it is the express intention of the law that each local Sanitary Authority, rural or urban, should in its respective district see strictly to the enforcement of the obligation, and give all proper aid to its due fulfilment. Each Authority is bound by law to see that the drains, water-closets, privies, and ash-pits in its district are so constructed and kept as not to be a nuisance: and with reference to these and various other matters of concern to health, each Authority is bound by law to make from time to time (either by itself or its officers) inspection of its district for the purpose of ascertaining what nuisances exist calling for abatement under the provisions of the Nuisances Removal Act, and

the Authority must enforce those provisions against the nuisances. In order that residents may have necessary common facilities for disposing of their refuse, the Authorities are bound by law to make such sewers as may be necessary for effectually cleansing and draining their districts: and they may either themselves undertake or contract for the removal of refuse from premises and the cleansing of privies, ash-pits, and cesspools, or may make bye-laws imposing these duties upon the occupiers of the premises.

In the detailed application of the law different districts and parts of districts require, at the hands of their Authorities, a management graduated according to circumstances: certain circumstances requiring only the general supervision of the Authority, while others require, in higher and higher degrees, that the Authority should itself intervene and operate. The holder of outlying rural premises will generally be able to consume his own refuse-matters satisfactorily on his own or some closely adjacent land: and the sanitary Authority, in regard of such cases, has only to make sure that the essential objects of the Nuisances Removal law are attained. Even here, however, it will always be requisite to see, as regards laborers' cottages and other like cases, that refuse is not thrown or accumulated in situations where its effluvia or soakings can be offensive or injurious; and the relation of privies, piggeries, cattle-stalls

and dung-heaps, and of their several outflows, to the walls of dwellings and to sources of water-supply, must always be cautiously observed. In proportion as dwellings are aggregated, and populations increase, in villages, towns, and cities, it becomes more and more difficult for refuse to be properly disposed of by the separate action of individual householders. In very early stages of such aggregation, the Authority finds itself called upon to provide common sewers for the joint liquid refuse of the localities, and more or less common scavenging, not only for the public ways but in aid of the defæcation of private premises; and these collective services require to be more and more developed in proportion as populations become more and more urban. In proportion as such facilities are not given, more and more vigilance is wanted under § 20 of the Sanitary Act, 1866, to see that nuisance do not arise from individual mismanagement of house-refuse, — that, in places unprovided with sewers, nuisance be not caused by slop-water, — that, in places where water-closets are impossible, nuisance from bad privy-management do not exist, — that, in places to which scavenging does not extend, nuisance from filth-accumulation do not arise on individual premises. On the other hand, with the growth of the collective services, the Authority more and more finds that (greatly to the advantage of the public health) it has become the preventer rather than the remover of nuisances; and so universally is this the

fact that, bearing it in mind, Sanitary Authorities, when proceeding to think systematically of their duties, will generally find it advantageous to regard the prevention rather than the removal of nuisances as their main administrative problem.

26. Sewerage and scavenage between them have to do all the work of each Local Authority in carrying off the refuse of the district: the privy-refuse, the ashpit-refuse, the slop-waters, and in certain cases trade-refuse and the refuse of domestic animals. Sewerage and scavenage — assisted, as regards the matters which are within their range, by proper bye-laws, and supplemented, as regards the matters which are outside their range, by proper enforcement of the law against nuisances, — they, thus assisted and supplemented, and of course with adequate supply of water, are the two essential agencies of all local cleanliness. In proceeding to settle any scheme for their local application, the question first to be decided is, which of the two is to deal with privy-refuse; but whichever way this decision is to go, a clear view must always be had as to the eventual disposal of both sorts of refuse.

Removal of refuse has two main divisions: sewerage and scavenage.

27. All Local Authorities collecting refuse-matters, whether by sewerage or by scavenging, have, of course, to dispose of them in ways which shall not cause, or shall

All disposal of refuse-matters must be so managed as not to make nuisance.

cause as little as possible, any nuisance in relation either to air or water: and this (sometimes difficult) obligation is at present urging itself on the notice of many Local Authorities as virtually a new problem with regard to the outfalls of liquid refuse. The obligation, not to cause nuisance by sewage outfalls, exists in an infinite range of magnitudes: from the vast sewage-tunnels of London on the one hand, to the little village-sewer and its occasional flushings on the other; but, whether as to village slop-waters or to great urban sewage-floods, equally it has to be provided that no avoidable atmospheric nuisance shall be produced by the outfall, and that all natural water-courses (or at least all such as may be giving domestic supplies) shall be protected as far as practicable from pollution. Along the coast-line of England there may be cases in which those conditions will be most conveniently and cheaply attained by letting the sewage run as mere waste (subject to such precautions and with such engineering arrangements as may be necessary) into river-estuaries or into the sea: but this course, in the cases where it is possible, is not by any means necessarily to be preferred: for sewage contains the essential elements of fertilization for land, and land ought always to be considered its proper destination except where from particular local circumstances this use of it would involve too much cost to be profitable. In the large majority of cases throughout England an option of

entirely wasting sewage as above does not exist: on the contrary, the obligation not to cause nuisance by sewage-outfalls will be found in general to involve as its consequence that the sewage must be purified by land; which generally will in return by increased fertility yield more or less pecuniary set-off against the cost of such constructions and service as the use of that method of sewage-disinfection may require. Evidently, then, the management of sewage-outfalls is a matter for serious consideration by Local Authorities: so that on the one hand each inhabited area may best eliminate every sort of fluid refuse which it produces, and that, on the other hand, the required prevention of outfall-nuisances may be economically as well as effectually attained. To improve public knowledge on the means of attaining those objects has for many past years been the object of continuous elaborate study under successive Royal Commissions; and it is to be desired that all persons who have to deal responsibly with the disposal of refuse-matters should be acquainted with the practical conclusions to which that study has led, as particularly represented in the very valuable reports of the Rivers Pollution Commission, 1868.

28. As regards means for disinfecting sewage the Commission reports that purification in such degree that the outflow may properly be allowed to pass into the running waters of

Disinfection of sewage.

the country, can be got under certain conditions by the action of land upon the sewage, but not in any other practicable way; and that, in order to the required action of land on sewage, two methods are available: the method by *agricultural irrigation* and the method by *intermittent filtration.*

Of these two methods neither can in practice be so applied as not to include some participation of the other: for filtering beds have of course more or less irrigated surface, and irrigated fields have of course more or less downward filtration: but, except so far as there is this accidental overlapping, the methods contrast with each other in respect of the natural forces to which they chiefly appeal; and, while they both effect the purification of sewage, their collateral results are widely different. The irrigation-method bases itself on the *appropriative* action which a certain surface of cultivated land with growing crops on it exerts over organic matters supplied to it as manure: the case for it exists in proportion as there is suitable land in the comparatively large extent which suffices to utilize to the utmost the fertilizing power of sewage: and the intention is that this land, while disinfecting the sewage, shall also yield adequate pecuniary return in irrigated crops. The filtration-method, on the contrary, bases itself on the *destructive* influence which a certain cubic quantity of well-aerated porous earth, receiving organic matters at intervals on its surface, and discharging them

below, will exert on them as they gradually sink (followed again by air) through its thickness: it requires plots of suitably-placed porous land, deeply under-drained, to be used in rotation as disinfecting-ground for the sewage delivered on to them; and the method is such that, though more or less vegetable produce may be obtained from the comparatively small area of land which suffices for these filtration-plots, the fertilizing powers of the sewage are of necessity in great part sacrificed.

In view of the sanitary intention of these processes, Local Authorities adopting either of them must, of course, see that it effects its proposed action completely, and that it does not cause any nuisance of its own. In choosing localities for irrigation or filtration, in designing the works for either purpose, and in the day-by-day management of such works, every possible care must be taken that all populations within range of influence of the works shall be safe from injury, whether through air or through water; and as regards the latter, it must be particularly cared for that the quantity of land, and the details of the application of sewage to it, shall be such as will, under all variations of seasons and weather, always effectually purify the sewage before it can have access to any watercourse. The standard of the Rivers Pollution Commission, on the presumption that rivers are not to supply drinking-water, is, that irrigation-land at the rate of at least an acre for every

100 of the population, or filtration-land at the rate of an acre for every 3,000 of the population, will give to sewage such degree of purification as to justify its being allowed to pass into rivers; but with what least quantity of land (properly used) the purification of sewage will be so complete that the outflow of the land shall be safe drinking-water, is a question which has yet to be answered by local experiences.

Limits of the utility of sewers, as regards what must, and what may be conveyed by them.

29. Among the conclusions of the Commission, there are two which may particularly assist the judgment of Local Authorities as to getting full use of sewerage in populous places. First, namely, with reference to the present state of the case as to excremental refuse, it appears that the ordinary sewage-problem, as to the means of preventing nuisance from the outflow of populous places, is not materially lighter in places where water-closets are few or none, and where systems which purport to withhold privy-solids from the sewers are in use, than it is in places where water-closets are general. It appears that in all places of the former class the sewage has in fact under the existing arrangements universally received a very large proportion of human refuse: and that apparently the mere house-slops and street-washings of populous places (not to mention other sources of pollution) must in themselves, under any conceivable

system, constitute a highly offensive outflow, requiring substantially the same treatment as the sewage into which water-closets empty. And secondly, the Commission reports that, for populous places which are also seats of manufacture, it would generally be possible, without materially complicating the sewage-problem, to allow the fluid refuse of industrial processes, with few exceptions, to pass into the sewers to be disposed of as common sewage: the special exceptions which are named being the refuse of workers in metal and of manufacturers of gas, paraffine oil, pyroligneous acid and animal charcoal: that, subject to some such exceptions as these and to proper regulations, the discharge of fluid industrial refuse into sewers would generally not render the sewage more difficult of use, and would in some cases, in respect of certain contained refuse-matters, greatly increase the agricultural value of the sewage.

30. Of sewers and drains, with regard to the technic of their construction, I of course do not pretend to speak. All rules applicable to this matter are given in a special Memorandum issued by the Board for the assistance of local officers, which, as having been prepared by Mr. Rawlinson, the Board's Chief Engineering Inspector, has the authority of an unequalled experience; and my reference to sewers and drains is only in regard of their sanitary results. In proportion as they are

Sewers and drains as means of cleanliness.

skilful or unskilful appliances, so they become powerful influences for good or for evil; and in this point of view, I would urge the necessity of such works (even though on the smallest scale) being always planned with adequate skill and executed under trustworthy supervision. In the same point of view I would also urge the importance of using as channels for liquid refuse none but properly constructed sewers and drains, and of therefore superseding by such constructions, as soon as practicable, the many now existing mere gutters, or ditches, or rude irregular works of brick or stone, which, originally meant only for rain-water, are incapable of fulfilling in an effective, cleanly and wholesome manner, the purpose for which modern sewers are designed. This recommendation applies not only to cases where the channels receive privy-drainage, but likewise (for reasons previously explained) to cases where they receive only slop-water: and equally in both cases it must be provided that any sewer which is not completely self-scouring shall at due intervals have effective flushing. With regard to the smaller relations of the subject, as represented in the collection of village-slops, useful information will be found in an appended report[1] by Mr. Netten Radcliffe (to which I shall hereafter more particularly refer) on means of preventing excrement-nuisances in towns and villages.

[1] Like others, already named, this cannot be reprinted.

31. The choice between a water-closet system and a system of so-called dry-privies, is necessarily in each case a question for local judgment on grounds which in great part must be purely local.

Shall water-closets be adopted?

32. The advantages of the former, where it can be adopted and will be properly worked, are — as regards the supremely important object of getting the refuse continuously and completely removed — too evident to require advocacy. Those advantages however may fail to be realized if the system be adopted without due circumspection; and the conditions which ought to be kept in view in order to avoid any such failure are apparently these three: —

Their advantages where certain conditions can be fulfilled;

First, that the closets will universally receive an unfailing sufficiency of water properly supplied to them;

Secondly, that the comparatively large volume of sewage which the system produces can be in all respects satisfactorily disposed of; and,

Thirdly, that on all premises which the system brings into connection with the common sewers, the construction and keeping of the closets and other drainage-relations will be subject to skilled direction and control.

as to water-supply;

(*a.*) The water-supply of a place should not be deemed sufficient for a system of water-closets unless it be such that each ordinary water-closet can be flushed as often as it is used. If the supply be professedly "constant" it must be really constant, subject only to the occasional short interruptions which may be necessary for repairs and the like, and against the possible dangers of which (§ 19) proper precautions must have been adopted; if, on the contrary, it be confessedly intermittent, and therefore require domestic storage of water, the supply of water (sufficient to fill all house-cisterns) should be at least once in every period of twenty-four hours; and in any case proper mechanical arrangements to prevent waste of water and to secure the water-pipes against entrance of privy-air will be necessary.

as to sewers;

(*b.*) In order to a satisfactory discharge of privy-sewage, properly constructed sewers, with properly located outfall, are of course indispensable: sewers which would also convey the slop-waters, and generally the rain-fall, or more or less of the rain-fall,[1] of their drainage-area. It may sometimes be the case that sewers already existing, and in all respects satisfactorily working as provision

[1] In some districts special arrangements for the discharge of storm-waters may be necessary; and in some it may be desired to effect as far as practicable a diversion of all clean rainfall from the sewers: but the consideration of questions of this sort will be special to the localities where they arise.

for slop-waters and surface-drainage, are of such construction and with such outfall-arrangements as to be suited also for the addition of privy-sewage, or capable at very moderate expense of being rendered so: for as slop-waters partake (in greater or less degree) of the offensive qualities of privy-sewage, sewers which are to convey them require the same sort of care as to construction and outfall-arrangements as if privy-sewage were also to be conveyed. If existing slop-water sewers are offensive or inefficient in the service in which they already act, or if their outfall is such as already to cause nuisance or water-pollution, evidently no such additional service as the conveyance of privy-sewage can be claimed of them in their actual state: but in this class of cases (and according to the degree of offence or inefficiency) the local sewerage would be judged to require reform, even apart from any question of water-closets; and in connection with any such reform, especially in towns which have or ought to have common water-works, there will be favorable opportunity for considering whether a system of water-closets should be adopted.

(*c.*) No premises ought, either through water-closets or in any other way, to be brought into drainage-connection with common sewers unless they can be made reasonably secure against the dangers of sewage-infection. Part of such security would consist in the fact of the sewers them- as to communications;

selves being such and in such state as they should be, especially with regard to scouring and ventilation: but a further, very essential, part would depend on the proper situation, construction, and keeping of the drains and drain-inlets of individual premises. In this latter respect, the following conditions ought to be insisted on: —

That every private drain be properly trapped and ventilated in relation to the common sewer, and be itself also properly constructed;

That every private drain having inlets within a house, have ascending from its head or heads into some suitable high position in the open air, and where it cannot infect the interior, a ventilating-pipe or ventilating-pipes of sectional area amply proportionate to its own;

That all slop-water pipes from within houses be provided at their sinks or other inlets with fixed traps, but further, that, as far as practicable, they be separate from privy-pipes, and made to end open over trapped drain-gratings outside the house, not direct into privy-pipes or drains;

That no overflow-pipe from any cistern which furnishes domestic tap-water, nor from any cistern inside a house, be allowed to open directly into any drain or privy-pipe, but be made (as above) to end open in the outer air;

That in cases where water-closets are supplied on a "constant" system, and where generally there will not be storage-cisterns, the entrance of privy-air into water-pipes be prevented by the adaptation of special service-boxes (which also will act as waste-preventers) to all such privies as have not cisterns.

(*d.*) In considering the admissibility of water-closets, it has always to be remembered that the working of an ordinary water-closet is easily deranged, and that water-closets, when out of order, and especially if in the interior of houses, are apt to become very dangerous nuisances. The ordinary water-closet is therefore a thoroughly ineligible form of privy for those who are unlikely to take proper care of it, or are from poverty unable to give it such occasional repairs as it may require. as to users;

(*e.*) Among such classes of population it is of course unfit that any form of in-door privy should ever be sanctioned: but even in the best-ordered houses the occasional danger of in-door water-closets must not be disregarded. Water-closets ought never to stand where they cannot have outside windows: they ought if possible to stand as projections from the body of the house, and with windowed lobbies dividing them from it. as to location.

Where water-closets not to be adopted, what are the best alternatives for cleanliness?

33. It must be assumed that, even in large towns, Authorities, exercising their discretion on skilled advice given to them, will sometimes pronounce against the local adoption of a system of water-closets; and even if it be assumed that the number of such cases will eventually be small, yet, at least for the present, great importance attaches to the question of other means by which privy-nuisances in large towns can be prevented. And it is the more necessary that all such means should be well understood and as far as possible perfected, because permanently it must at any rate be the lot of many small towns and of most villages to depend on them rather than on water-closets.

In a former section of these observations I described at some length the extremely filthy and dangerous arrangements which frequently, or I fear I should say generally, exist in places where water-closets are not in use. Modern experience, however, has shown, and the fact is of the highest sanitary importance, that such arrangements are not the necessary alternative to a system of water-closets; but that, failing a water-system, both large and small populations can obtain under other and amended systems of privy-management a complete or comparatively complete freedom from excremental nuisance and injury.

Evidence to that effect was given five years ago in

two most valuable papers which I had the honor of submitting to my Lords of the Council as appendices to my Twelfth Annual Report: one by Dr. Buchanan on the earth-closet system, the other conjointly by him and Mr. Netten Radcliffe on the privy-systems of various northern towns; and from that time till the present the information collected in these two reports has been the basis of all advice which I have given in the matter to which they relate. Recently, under the Local Government Board, the present state of experience in the same important branch of nuisance-prevention has been made matter of new and large investigation by Mr. Netten Radcliffe; and I have the honor of submitting to you (App. No. 7) his comprehensive and thoroughly practical report on the subject.

Former and present departmental inquiries.

34. The improved systems which Mr. Netten Radcliffe describes start universally with abolishing all such filthy catchment-provisions as I have referred to, and then, in order to meet the sanitary requirements, provide more or less as follows: —

Mr. Netten Radcliffe's present report.

Pail-Privies: having as their aim that excremental matter, unaltered, shall be removed from the privies at so short intervals as not to have become offensive; and adopting as means to this end the use of movable receptacles, which sys-

tematically at short intervals are to be changed, clean for dirty by the scavenger; and which, for the prevention of nuisance in this process have close-fitting air-tight lids to be applied to the foul pails under removal.

Ash-Privies: wherein the professed purpose of the north-country midden (to deodorize excrement by covering it with dry house-refuse) is, under strict precautionary conditions, accepted; the intention being, that the space beneath the privy-seat (but no further space) should be converted by careful masonry into a non-porous catchment-chamber, planned in slope and otherwise with particular reference to ease and frequency of systematic scavenging, and necessarily of but small size; and that into this chamber, and direct upon the excrement, the ashes of the house should be thrown, either down the hole of the seat, or with the seat hinged and lifting for the purpose, or otherwise.

Earth Privies: as introduced by the Rev. H. Moule: purporting to effect under strictly defined conditions such applications of earth to excrement as shall render the latter inoffensive, forming with it a manure which not only can without offence be stored where it is produced, but can also, after being stored and dried, be used in the privy again and again with the same effect as

new earth, and with some progressive increase of manurial value.

Charcoal-Privies: intended to utilize, on the general plan of earth-privies, the still higher disinfectant powers of charcoal, and thus to reduce to a minimum the quantity of disinfectant required: and purporting to have the further advantage that the excrements themselves can be made contributory to the supply of the charcoal.

35. With general reference to the duty of filth-prevention in inhabited areas, it is necessary to observe that the actual management of privies tends to become a function of Local Authorities, first, in proportion as dry privies of any kind are in use in their districts, and, secondly, in proportion as the districts contain dense settlements of ignorant and dirty population.

In certain cases, Local Authorities have special responsibilities as to privies, viz.:

(*a.*) The dry systems, if they are to be generally available in any populous district, must always be vigilantly superintended, or in most cases actually managed, by the Local Authority, and must be managed with forethought and competent skill. The Authority must in the first place decide as to the type of construction to which it will require householders to conform in regard of the placing of privies, and in regard of the plan of their privy-fixtures: not allowing privies to be so placed that the use of them will be a nuisance to houses or

where dry privies are in use;

will make the privy-scavenage needlessly difficult or offensive, and carefully regulating the plan of the privy-fixtures (whether for earth-privy, charcoal-privy, pail-privy, or ash-privy) in the ways best calculated to prevent nuisance and facilitate scavenging. If the earth-system be adopted the Authority must prepare and supply the earth; if the pail-system be adopted, the Authority must supply the pails; and whether earth-system, charcoal-system, pail-system, or ash-system be adopted, the Authority must (except in individual cases) scavenge the privies and dispose of the refuse which is removed. Pail-privies and ash-privies in towns should be scavenged as far as practicable daily, and even where the population is least dense, at intervals not exceeding a week. Whether the Authority in acting as above shall act through its own officers and servants or through contractors will be a matter of local discretion; but, so far as it acts through contractors, it must of course see strictly to the execution of the contract, and in all cases it will have to make such bye-laws as are wanted to give effect to its system.

and where poor populations are thickly aggregated.

(*b.*) Sometimes even in country districts, but with more and more frequency in proportion as districts are urban and populous, particular poor neighborhoods require that their privy-accommodation, whatever be its sort, should be specially cared for, and sometimes (which must be under urban powers) actually provided by the Authority.

(*c.*) Though ordinary water-closets (and particularly within doors) are not proper for the use of dirty and ignorant populations, water-closets, specially constructed with regard to such classes of population, and managed or constantly superintended by the Local Authority, seem the best of all yet discovered privy-contrivances for the uncivilized quarters of towns: and in this respect the experience of Liverpool deserves attention, as showing that freedom from privy-nuisances can be attained in even the lowest of urban quarters on condition that a proper system of trough water-closets is managed by an efficient Local Authority.

Construction of privies for large joint use by lowest class

(*d.*) Whenever privies of any kind are used in common by many families, or are for general public use, it is essential that the Local Authority should have them under constant supervision, and that (whether they are or are not of a sort to require scavenging of contents) the cleanliness of the privy itself should be systematically and strictly cared for. In cases where the use of the privy is common to all comers, servants of the Authority must of course keep it clean: and in cases where the use is common only to a defined group of houses or families, a definite understanding should be had as to the performance of the duty, either by the using families in regular rotation, or by their landlord or some one else on their joint behalf; and some

and the supervision of such privies.

appointed officer of the Authority must see strictly to the performance of the duty. Also in either case the privy must be protected against wilful damage, and wilful or negligent fouling: and vigilance should be used (particularly when the privies are first coming into local use) to detect, with a view to future prevention, any such abuses of the convenience.

Cleanliness as regards (so-called) dry refuse;

36. In cases where the water-closet system is in full work, and where consequently no excrement-removal has to be done by cart, necessity still remains (at least in populous places) for a certain quantity of other scavenging. In order that nuisance shall not arise from the so-called dry refuse of houses, regularity and frequency of removal are first conditions; and in populous places such removal needs, of course, to be done as a systematic act of the Authority.

must advert to the putrescent quality of parts of it;

(*a.*) It has to be assumed that the dust-heap of each household contains almost invariably more or less of decomposing moist organic matter: the refuse or professed refuse (often far too lavishly so professed) of the different comestibles of the house: the peelings and other waste-bits of vegetables, the guts and other waste-bits of fish or birds, and so forth: and the necessity for frequent removal has to be estimated, not by what the mere fire-ash and other dry dust would require, but by the extreme offensiveness of these

usual adjuncts. Households, not of the poorer classes, can, with proper management, keep their dust-heaps comparatively free from organic refuse: the larger households, namely, by daily utilization of their kitchen-waste, and many smaller households by burning theirs on the kitchen fire. But the moderate amount of care which would serve in these ways to prevent nuisance is in a large proportion of the cases absent, and in other cases, immensely numerous, the suggested prevention would be quite impossible: for the domestic power of burning refuse is limited by the poverty which must spare fuel, and many large towns have masses of poor population to whom such fires as would consume even the scant potato-peelings or spoilt cabbage-leaves of the house are luxuries entirely unknown. Scavenging-arrangements in relation to house-refuse in towns must therefore be framed with special reference to the fact that such refuse soon becomes highly offensive, and that, except where good domestic management exists, any two-days' retention of it makes a nuisance. It has to be remembered too as an actual fact, though representing a state of things which ought as far as possible to be resisted, that so-called dust-heaps in poor neighborhoods very often contain some, and not rarely a good deal of excremental matter: cast there sometimes in mere dirty indolence, and sometimes because of a shameful want of privy accommodation.

must not let it accumulate or get wet;

(*b.*) House-refuse, awaiting removal, ought especially not to be exposed to wet. Liquids of course ought never to be thrown with it; and the ash-heap, or fixed or movable receptacle used for ashes, ought always to be protected against rain. A movable ash-tub, standing under a shed, is perhaps generally the best receptacle for dry-refuse, is particularly suited to the crowded parts of towns, and is the only proper arrangement for cases where the refuse must be carried through the house. If a fixed dust-bin be used, its walls should be smooth and impermeable, and its location and construction such as to give every facility for sweeping out. No receptacle should be of unnecessary size, but merely large enough to contain such accumulations as must occur in the proper intervals of removal.

may in some cases advantageously burn it.

(*c.*) It is not requisite in this place to say any thing with regard to the eventual utilization of dry refuse. But it may be convenient here to note, with regard to cases where utilization is not in view, that accumulations of offensive refuse may sometimes advantageously be burnt: namely, with the addition, if necessary, of lime, ashes, or other drying material, and with an admixture of cinders or small coal: and that this process (which gives an ash useful for deodorization) may, in proper situations, be conducted either in coking-ovens, or in suitably-disposed open heaps.

37. I perhaps hardly need note that the due scavenage of public ways is among the requisites for such local cleanliness as the public health requires. The filth of ill-kept streets contains, with the inorganic detritus of road and wheels, large quantities of the dung and urine of horses and occasionally other cattle: while in the courts and alleys of poor neighborhoods, and even in many obscure streets, the case is made worse by an admixture, sometimes not small, of human excrement: and it is therefore essential that street-refuse should share the general obligation of filth to be promptly and properly removed. In quarters which will admit of it (and especially in poor neighborhoods) the use of the hose in aid of the shovel and broom may be of great service.

Cleanliness as regards public ways;

Public ways cannot be kept clean unless they are of suitable surface (so paved, namely, as not in any avoidable degree to favor the imbibition or other retention of filth) and are provided with proper rain-channels. In poor neighborhoods this requires special attention: the extension of good pavement into all courts and alleys, whether legally public or private, is essential to their means of cleanliness: and generally with regard to all yards and curtilages, whether of rich or poor, the provision of impervious pavement on ground which adjoins houses is a valuable security in the same direction. The same rule applies to the basement of houses in

and the sanitary importance of good pavement.

regard of parts on which slop or other dirt is apt to fall.

Cleanliness as regards offensive sorts of business, and the keeping of animals.

38. The general sanitary obligation to prevent injurious action from refuse-matters includes of course that sufficient regard shall be had to the conduct of those sorts of business which produce animal or vegetable refuse, or are in any other way apt to give putrescent effluvia or putrescent outflow. Thus, for instance, slaughtering-places, whether in towns or in villages, always require particular attention, as to their means of water-supply and drainage and ventilation, as to their having proper receptacles and regular prompt removal for all their refuse-products, as to their not occasioning any filthy soakage within or without their limits, and generally as to their being kept in a clean state and (as far as can be) without offensive odor. So of course, in populous places, all keeping of animals requires to be looked after with reference to the due removal of the refuse, and with reference also to animals not being kept (as great numbers of pigs often are) in situations so contiguous to houses that their keeping must necessarily be a nuisance: and, whether in towns or villages, no offensive outflow or soakage should be allowed from any cattle-shed or pig-sty which would not be allowed from a human privy. The action of Local Authorities, or of contractors under them, in collecting and disposing of the solid

house-refuse and surface-filth of districts, requires, of course, the same sort of care as other sorts of business which deal with putrescent matter; and particularly as regards places of temporary deposit for collected refuse, and processes which the refuse may there have to undergo, the sites should be so chosen, and the processes so conducted, as not to cause avoidable nuisance.

39. In a different point of view from that of the preceding observations, I have yet to mention one more function which has to be discharged by those who would reduce the prevalence of Filth-diseases in England. In an earlier page I noted that, in proportion as a district should be well cared for in such respects as have now been explained, nuisances would so largely be prevented in it that comparatively few could present themselves for removal. Exceptionally however even under such circumstances, and abundantly of course in districts which have been ill-cared for, the abatement of various refuse-nuisances, and particularly the removal of accumulated refuse, is a duty which has to be performed in order (so far as may still be possible) to the prevention of disease; and I have therefore here to advert to it in that sense.

Abatement of refuse-nuisances when found existing.

With reference to houses which are said to have offensive smells, or which Inspectors find in a stinking state, it cannot be too distinctly understood that

cleanliness and ventilation and dryness are the proper deodorizers of houses, and that artificial deodorizers will no more serve in their stead than, in regard of persons, perfumes could serve instead of soap and water. As against old frowsy and mouldy states, something supplementary may be got by free washings with hot lime-wash, or, in close spaces, by fumigation with sulphurous acid: but truly to deodorize a house is, to see that no house-refuse (not only no excremental matter, but also no other kind of dirt or refuse, nor any foul old wall-papers or other hangings) remain in or about it; and to see that all proper washings and lime-washings be duly done; and to see that its basement be thoroughly dry; and to see that the air within it be not in any part stagnant, but always in course of renewal from without. Similarly, where the complaint is of drainage-odor within a house, search should be made whether the filth which house-drains are meant to carry away is retained in or near the premises in ill-made drains or in cesspools, or perhaps is leaking from house-drains within the house; or whether, inside the house, the inlets of drains and sinks are not properly trapped, or the pipes themselves have holes in them; or whether, outside the house, the ventilation of the drains and sewers is insufficient.

Where offensive matters have been allowed to accumulate in large quantities, the disturbance of them for removal (as in the emptying of ill-condi-

tioned privies or cesspools) ought to be with special precautions; both in order to reduce the mere offensiveness of the process, and also to obviate, so far as may be, the dangers which the effluvia may represent. For the latter purpose, chemicals of an antiseptic sort are perhaps those which will be most generally applicable, and may be such, or in such combination, as also much to deodorize the filth; but, for the limitation of stink, privy-refuse should, at least in populous places, always be removed with special apparatus. Various refuse-heaps and mud-heaps, which for a time it may be impracticable or inexpedient to remove, should be covered, to the depth of two or three inches, with a layer of freshly-burnt vegetable charcoal in powder, or with a layer of clean dry earth, or of freshly-burnt lime; and earth near dwellings, if it has become foul by the soakage of decaying or vegetable matter, should be treated on the same plan.

Cleanliness as regards water-supply;

40. Finally, it will be evident that, as the use of impure water is a chief way by which filth-infections get entry to the human body, so, for the prevention of filth-diseases, a very strict insistence on purity of water-supply is quite essential. And this in my opinion is a matter with regard to which no sort of compromise should be considered safe. When proper local arrangements shall have been made for dealing with the excremental and

other organic refuse-matter of inhabited places, many water-supplies which now are a daily danger to life will through that reform become comparatively safe: streams namely at once, and wells after sufficient lapse of time; but I venture to repeat that in this matter a very strict standard of cleanliness is in my opinion essential to safety.

from streams;

As regards running waters, the reports of the Rivers Pollution Commission seem to have clearly shown that the fouling of natural watercourses by direct infusion of liquid refuse is a nuisance which, at least in all ordinary cases, Local Authorities may reasonably be required to suppress by application of the sewage to land; and though conditions are not yet defined under which streams, otherwise safe as drinking-water, can, without detriment to their potability, receive the outflow from sewage-receiving land, it may, I think, fairly be expected that to fulfil satisfactory conditions in that respect will in general be of no insuperable difficulty. Whether in particular cases populations may be so circumstanced that they cannot refrain from polluting streams, is a question which would in each separate case have to be judged on its own merits: only, if they must pollute the water, let the water be frankly recognized as unclean. Thus, regarding rivers as sources of drinking-water, one of two positions ought, I submit, to be consistently aimed at: either that, being a necessary source of

domestic water-supply, the river shall be absolutely protected against pollution; or else that, being (in whatever degree) used as a sewer, it shall be classed as not fit to supply drinking-water.

As regards wells, two cases must be distinguished. In the case of densely inhabited areas, it is certain that, however rightly the refuse-disposal may be conducted, the surface-wells can never be other than most dangerous sources of supply; and deep wells (which of course can only be trusted on condition that they are demonstrably protected against the chances of downward pollution) are only possible under certain geological conditions. It must therefore often be, that considerable centres of population will not be safely supplied with water unless the water come from outside the inhabited area; and in regard of the origin and course of any such extrinsic supply, the town population ought to be extremely vigilant. Among comparatively scattered populations wells (and in great part surface-wells) must often be the source of supply: and it is of the greatest importance to discriminate between such as may and such as may not be safely used, and to insure for all those which are to continue in use the completest attainable protection against dirt. Wells, adjacent to such privies and other filth-deposits as are now common in rural districts, are probably at present the chief means by which enteric fever spreads in such neighborhoods; and however much

from wells.

the system of refuse-disposal in such districts may be improved, it can scarcely be hoped that surface-wells contiguous to dwellings (such as particularly the shallow dip-wells attached to cottages) will ever be safe against pollution. It is therefore greatly to be desired that, in each village, there should as far as practicable be common centres of supply; if possible, springs or deep wells; and, in any case, with the most careful protection against foulings by slovenliness or by accident. In rural districts which (for geological or other reasons) cannot have safe water-supplies by springs or wells as above, arrangements for the collection and storage of rain-water, with every possible care that the water shall be collected and stored without pollution, are necessary to meet the wants of the population; and the receptacles which must be part of any such system ought, if practicable, to be above ground.

Reminder that the preceding observations have aimed only at one group of removable causes of disease.

41. Throughout the above observations I have always, I hope, sufficiently shown that, while regarding Filth as the deadliest of our present removable causes of disease, I am far from regarding it as the only evil influence against which Sanitary Authorities have to contend; and though the object of my present Supplementary Report has been only to advert to the means by which enteric fever and the diseases ætiologically[1] akin to it may be prevented,

[1] i.e., having similar causes.

I would in conclusion observe that, however admirable may be local arrangements of sewerage and scavenage and water-supply, and however complete in consequence may be the extinction of the diseases which arise exclusively from Filth, other excesses of disease will still have to be extinguished by such other preventive measures as are appropriate to their modes of production. On that subject I do not here pretend to enter: but having above (§ 5) specially named one influence as being, like Filth, of most destructive and probably universal operation throughout England, I would here specially, though but in a word, revert to it. And as regards that deplorable facility with which dangerous contagions of disease are allowed so generally to diffuse themselves in this country, often no doubt by co-operation of Filth, but also often independently of it, I would finally urge, as of interest to all districts, that, side by side with such endeavors for strict cleanliness as it has been the object of my preceding observations to recommend, the utmost vigilance should likewise every where be used with regard to all first cases of infectious disease, and every thing be done, which the state of the law permits, to prevent the scattering of seeds of contagion.

JOHN SIMON.

APPENDIX

NO. 1.

Illustrations from Inspectors' Reports of the four years, 1870–73, *of circumstances in which Enteric (Typhoid) Fever is commonly found prevalent.*[1]

DR. THORNE.—Epidemics of enteric fever and scarlatina; chiefly in Appledore, where streets and courts extremely ill-constructed and ill-drained, with excrement and refuse lying about everywhere. Water sources befouled. At Northam polluted water and excrement nuisances.

Appledore and Northam (Devon.). 1870.

DR. BALLARD. — Enteric fever first attacked dairyman, and then spread to a large number of his customers. His well was found to be extensively contaminated with sewage.

Armley (Yorks.). 1872.

MR. RADCLIFFE. — Epidemic of enteric fever. Water supply insufficient, and partly from questionable sources. Want of outlets for house drains. Accumulations of excrement. Want of scavenging.

Ashton in Makerfield (Lancaster). 1872.

[1] Various other diseases are apparently increased by the same circumstances, as will be noticed in several of these reports. — AM. ED.

Banbury (Oxon). 1872.

DR. BUCHANAN. — Some of the fever found to have been imported; room for further sanitary improvement. In regard of nuisance removal, many conditions worse than on 1866 inspection.

Barking (Essex). 1873.

DR. HARRIES. — Enteric fever prevalent. Unwholesome water. System of drainage and sewerage imperfect. Passage of sewer air into houses. No arrangement for removal of excrement and refuse. Soil saturated with filth. Overcrowding and other nuisances.

Barking (Lodge Farm). 1873.

DR. BUCHANAN. — Enteric fever had occurred among persons living in Barking, and working on the Sewage-farm.[1] No sufficient evidence whether the cause of the fever was on the farm or in the town. Water of a well on the farm derived largely from sewage effluence. Particular excremental nuisances also in the neighborhood of this well.

Barrow-in-Furness (Lanc.). 1872.

MR. RADCLIFFE. — Prevalence of enteric fever. A rapidly extending town with the population growing faster than house accommodation. Consequent overcrowding. Sewerage imperfect. A considerable portion of town has privies with middensteads, giving rise to much nuisance.

[1] A farm on which liquid sewage was spread as manure.

DR. CORFIELD. — Prevalence of scarlatina, measles, and enteric fever. General pollution of earth, air, and water by excrement. Want of privy accommodation. Spread of disease from overcrowded plaiting schools. Biggleswade (Beds.). 1871.

DR. BALLARD. — High mortality, especially of children, and great prevalence of diarrhœa.

Bolton town. Houses of operatives crowded together, badly ventilated, and often unfit for human habitation. Badly constructed privies and ash-pits, and neglect of them by the local authority. Imperfect scavenging and cleansing of the town, insufficient arrangements for sanitary inspection, and almost complete neglect of the provisions of the Sanitary Act of 1866, relating to the arrest of the spread of infectious diseases. Bolton Registration District. 1871.

Farnworth, Kearsley, Halliwell, and Astley Bridge (in varying degrees). Houses badly ventilated and premises undrained; overcrowding; privies and ash-pits badly constructed and neglected; nuisances not removed; insufficient arrangements for sanitary inspection, and neglect of the provisions of the Sanitary Act, 1866, relating to the arrest of the spread of infectious diseases.

Other parts of the Bolton Union. Houses badly ventilated or unfit for human habitation; premises undrained; overcrowding; insufficient privy accommodation; privies and ash-pits badly constructed and

neglected; nuisances not removed; in some places insufficient and bad supply of water; insufficient arrangements for sanitary inspection, and general neglect of the provisions of the Sanitary Act, 1866, relating to the arrest of the spread of infectious diseases.

Brecknock. 1873.

Dr. Harries. — Enteric fever. Defective drainage. Imperfect system of excrement disposal. Cesspits leaky and rarely emptied, and consequent pollution of soil water. Badly-constructed and improperly placed privies. Some houses unfit for habitation. Nuisances from animals and from accumulations of manure.

Doncaster (Yorks.). 1873.

Dr. Thorne. — Large general, and infantile mortality; endemic enteric fever and diarrhœa; epidemic scarlet fever and small-pox. Polluted water. Bad means of excrement disposal. Escape of sewer air into dwellings. Nuisances from piggeries. Neglected courts.

Dudley (Worc.). 1871.

Dr. Thorne. — Endemic scarlatina, typhus, enteric fever, and diarrhœa. Defective and insufficient sewerage. Polluted water in private wells. Inefficient excrement and refuse disposal. Ill-constructed, filthy, and overcrowded houses. Nuisances from pigsties.

DR. BUCHANAN. — Fever caused by the use, for drinking, of water from a brook polluted by sewage. Subsequent spread through excremental nuisances. Wells polluted by soakage from pigsties and privies. Overcrowded cottages. Ecton (Northampton). 1872.

DR. HARRIES. — Enteric fever endemic. Water supply plentiful, but obtained chiefly from wells which are in a porous soil, and liable to pollution from privies and surface drainage. Insufficient privy accommodation. No systematic provision for excrement disposal. Foul accumulations of all kinds. Serious overcrowding of houses in which colliers lodge. Hucknall Torkard (Notts). 1872.

DR. BUCHANAN.—Epidemic of enteric fever. Sewers defective. Arrangement for excrement disposal inadequate. Certain water supplies largely polluted with sewage. Necessity for appointment of medical officer of health, and for construction of a hospital for infectious diseases and a mortuary. Corporation have improvements in progress. Huddersfield (Yorks.). 1872.

MR. RADCLIFFE. — Excessive mortality from diarrhœa and fever. Most offensive form of excrement disposal by common privies. Faulty regulation of sewers. Inadequate water supply. Ill-constructed buildings. Want of scavenging. Leeds (Yorks.). 1871.

Middleborough (Yorks.). 1871.

DR. BUCHANAN. — Prevalence of small-pox, scarlatina, diarrhœa, and fevers. Pervious sewers, ill-ventilated. Imperfect arrangements for excrement disposal. Old houses ill-constructed.

Moseley and Balsall, Heath (Worc.). 1873.

DR. BALLARD. — Enteric fever broke out at a dairyman's. Fever evacuations thrown out into the privy. Fever spread among customers of two dairymen whose wells were polluted by soakage from this privy.

St. Just (Cornwall). 1870.

DR. BUCHANAN. — Scarlatina very fatal. Enteric fever habitually present. No precautions against infection. Almost universal foulness of soil and air about houses. Want of provision for excrement removal. Scanty and impure water supply. Unwholesome houses.

Sheerness (Kent). 1870.

DR. BUCHANAN. — Prevalence of enteric fever. Universal accumulations of excrement. Imperfect water supply. Deficient supervision over sub-let and lodging houses. Inefficient dealing with nuisances.

Tottenham (Middlesex). 1873.

MR. RADCLIFFE. — Serious outbreak of enteric fever. High rate of mortality from fever and diarrhœa. Absence of proper ventilation of sewers. Water supply contaminated with

decaying animal refuse. Ill-designed cesspools in parts not sewered. Nuisances from watercourses and ditches used as sewers, and from large deposit of sewage mud at the sewage works. Flow of sewage from the sewers disturbed by flood in February; consequent effusion of sewage on the lower parts of the village, and the escape of sewer air into the houses on the higher levels.

MR. RADCLIFFE. — There had been a severe epidemic of fever, probably not less than one thousand two hundred cases, mostly of relapsing fever, but with some typhus, in the past twelve months, in the families of laborers employed by the Tredegar Iron Company. Much overcrowding and very ill-constructed houses. Imperfect sewerage, and ill-kept privies and sewers, with insufficient water supply. Inefficient nuisance removal. Tredegar (Monm.). 1870.

DR. HOME. — Enteric fever and ague. Water supply insufficient and mostly unwholesome. System of sewerage very imperfect. Great want of privy accommodation. No proper system for removal of refuse. Many houses unwholesome from overcrowding and want of ventilation, and unfit for the residence of human beings. Wareham (Dorset). 1872.

DR. BUCHANAN. — Severe epidemic of true typhus. Enteric fever constant. (Whitehaven (Cumb.). 1870.

Radically bad construction of the poorer quarters of the town, with much filth, destitution, and overcrowding. Wide-spread fouling of earth and air with excremental filth. Neglect by the local authority of many of its sanitary functions.

DR. HARRIES. — Frequent prevalence of fevers and diphtheria. General sanitary supervision wanting throughout Union. Almost everywhere want of proper water supply and due excrement removal. Gross neglect of matters in some places, and no system of isolation or disinfection.

Worksop Union without the district of the local Board of Health. 1871.

MR. WAGSTAFFE. — High mortality from scarlatina and other fevers. Drainage and sewerage defective. Serious want of privy accommodation. Water supply scanty and largely contaminated by excrement. Combined action of the two authorities recently obtained.

Wycombe (Bucks.). 1870.

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